



Catchment-scale analysis of hydrological and agricultural impacts of small reservoirs

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Small reservoirs are dams built to intercept and store runoff water. Small reservoirs can be a resource for farmers by providing water for crop irrigation. In agricultural areas, small reservoirs are seen as a way to sustain agriculture in times of drought. Changes in rainfall patterns due to climate change, with higher rainfall in some seasons and longer droughts in others, and the need to maintain or even increase agricultural productivity are also prompting some stakeholders to promote the development of small reservoirs. The proliferation of small reservoirs in a catchment can put pressure on the water cycle and have a cumulative impact on river flows and other hydrological components, which in turn can affect other water uses and the quality of downstream aquatic environments (Habets et al., 2018). There is a need to better understand and quantify both the cumulative hydrological impacts and the agricultural benefits of small reservoirs.

We present here an analysis of the cumulative impact of small reservoirs on hydrology and crop yield in an agricultural catchment. This analysis is based on the modeling of a 20 km² catchment in southwestern France. We used a new agro-hydrological model called Mhydas-Small-Reservoirs, a model coupling hydrological and crop processes with farmers' water management decisions (Lebon et al., 2022). Several catchment situations were considered. These situations combine different levels of reservoir use (current situation with 26 reservoirs of which only 13 are exploited for crop irrigation, a situation with no reservoirs at all, a situation where reservoirs currently not exploited are used for irrigation) and different climatic years (dry year, wet year, and year with average rainfall). The simulations were analyzed in terms of crop yields and different water balance terms (flow, ET, irrigation withdrawal). From the preliminary results, we show the interest and the need to take into account the interactions between hydrological and agricultural processes to quantify the impacts due to small reservoirs. We also identify the need for observations in agrohydrological modeling applied to catchments with small reservoirs.

References

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